

REMARKS

Present Status of the Application

Claims 7 and 8 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement.

Claims 1-8 and 12-13 are rejected under 35 U.S.C 103(a) as being unpatentable over the state of the prior art admitted by Applicants (hereinafter “AAPA”) in the specification in view of Verhaverbeke et al. (US Publication No. 2003/0045098, hereinafter “Verhaverbeke ‘098”) and Verhaverbeke et al. (US Patent No. 6,491,763, hereinafter “Verhaverbeke ‘763”) further in view of Chang (US Publication No. 2002/0020432, hereinafter “Chang”).

In response thereto, Applicants have amended paragraphs [031] and [032] of the specification and claim 1. Claims 2 and 7-11 have been canceled. Currently, claims 1, 3-6, and 12-13 are pending in the application. Upon entry of the foregoing amendments, Applicants respectfully submit that all the pending claims 1, 3-6, and 12-13 are placed in proper condition for allowance, and reconsideration of all the pending claims is respectfully requested.

Response to Claim Rejections under 35 U.S.C. 112, First Paragraph

Claims 7 and 8 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement.

Specifically, the Office has held the original disclosure is silent about what is reference as the “proportions”, and therefore claims 7-8 reciting the “proportions” have

been rejected.

In response thereto, Applicants have amended the specification to remove the descriptions with respect to “proportions”. Besides, claims 7-8 are canceled, and therefore the 112 rejection thereof no longer stands formal.

Response to Claim Rejections under 35 U.S.C. 103(a)

Claims 1-8 and 12-13 are rejected under 35 U.S.C 103(a) as being unpatentable over AAPA in the specification in view of Verhaverbeke '098 and Verhaverbeke '763 further in view of Chang.

In particular, the Office in “Response to Arguments” has stated that the claims do not exclude any other processing steps because the claims are written using “comprising”. Besides, the Office has further held election of the SC1 solution of the RCA cleaning, i.e., $\text{H}_2\text{O}:\text{H}_2\text{O}_2:\text{NH}_4\text{OH}$ was made, while the $\text{HF}:\text{HCl}:\text{H}_2\text{O}$ solution and the $\text{H}_2\text{O}:\text{H}_2\text{O}_2:\text{HCl}$ solution are directed to non-elected species.

Responsive thereto, Applicants have amended claim 1 as indicated below:

A semiconductor cleaning method, **consisting of:**

rinsing a semiconductor wafer including a gate structure using an ozonated de-ionized (DI) water;

further rinsing the ozonated water-rinsed semiconductor wafer using a cleaning solution, wherein the cleaning solution is a $\text{H}_2\text{O}:\text{H}_2\text{O}_2:\text{NH}_4\text{OH}$ solution; and

additionally rinsing the further rinsed semiconductor wafer using the ozonated DI water. (**Emphasis added**)

As provided in paragraphs [006]-[009] of the original specification, an RCA cleaning procedure includes three major steps to be performed sequentially: I. Removal of insoluble organic contaminants with a 5:1:1 $\text{H}_2\text{O}:\text{H}_2\text{O}_2:\text{NH}_4\text{OH}$ solution (standard cleaning solution, referred to as SC1); II. Removal of a thin silicon dioxide layer where metallic contaminants may accumulate as a result of (I), using a diluted 50:1 $\text{H}_2\text{O}:\text{HF}$ solution; and III. Removal of ionic and heavy metal atomic contaminants using a solution of 6:1:1 $\text{H}_2\text{O}:\text{H}_2\text{O}_2:\text{HCl}$ (standard cleaning solution, referred to as SC2).

However, in the amended claim 1, the semiconductor cleaning method merely **consists of** rinsing a semiconductor wafer with use of an ozonated DI water, further rinsing the ozonated water-rinsed semiconductor wafer **using the SC1 solution**, and rinsing the further rinsed semiconductor wafer using the ozonated DI water. **The steps of removing the thin silicon dioxide layer with use of a diluted 50:1 $\text{H}_2\text{O}:\text{HF}$ solution and removing ionic and heavy metal atomic contaminants using the SC2 solution are not required in the claimed semiconductor cleaning method.** As such, the claimed cleaning method is distinct from the conventional RCA cleaning method as provided in the specification.

In addition, as indicated in paragraph [0006] of Chang, “**deionized water** is utilized to immerse the surface of the semiconductor wafer. Finally, an **ozonated water** is utilized to touch the surface of the semiconductor wafer.” The cleaning solution (**deionized water and ozonated water**) disclosed in the Chang reference is different from the ozonated DI water set forth in claim 1 at issue. Namely, Chang fails to teach or suggest “further rinsing the ozonated water-rinsed semiconductor wafer using a cleaning

solution, wherein the cleaning solution is a $\text{H}_2\text{O}:\text{H}_2\text{O}_2:\text{NH}_4\text{OH}$ solution; and additionally rinsing the further rinsed semiconductor wafer **using the ozonated DI water**” as claim 1 recites.

Based on the above, evening combining the teachings of AAPA, Verhaverbeke ‘098, Verhaverbeke ‘763, and Chang, the combination of the prior art references still fails to teach or suggest the above limitations of claim 1 and further of claims 3-6 and 12-13 dependent thereon, and people having ordinary skill in the art would not have arrive at the present invention set forth in the amended claim 1. Therefore, Applicants respectfully assert that claims 3-6 and 12-13 are non-obvious over AAPA, Verhaverbeke ‘098, Verhaverbeke ‘763, and Chang, taken alone or in combination, and accordingly the rejection of claim 1 under 35 U.S.C. 103(a) is traversed.

Since independent claim 1 is allowable, claims 3-6 and 12-13 directly or indirectly dependent thereon should also be allowed, for they contain all the limitations of their respective independent claim 1. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

CONCLUSION

For at least the foregoing reasons, it is believed that all the pending claims 1, 3-6, and 12-13 patently define over the prior art and are in proper condition for allowance. An action to such effect is most earnestly requested. If the Office believes that a telephone conference would expedite the examination of the above-identified patent application, the Office is invited to call the undersigned.

Respectfully submitted,

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